MISCELLANEOUS.

Ctenodus cristatus.

To the Editors of the Annals and Magazine of Natural History.

Leeds, May 3, 1875.

Gentlemen,—I am very willing to be corrected by Mr. Atthey; and this letter is to be regarded as in the main a request for further information.

In Messrs. Hancock and Atthey's original paper (Nat. Hist. Trans. N. & D. vol. iii. p. 61), and again in Mr. Atthey's note ('Annals,' May 1875), the *upper* surface of the palatal tooth of *Ctenodus cristatus* is said to be concave. I have always understood this to be their proposition, and controverted it by stating that in the example now in the Leeds Museum the *lower* surface is concave. No specimen which I have seen shows the upper surface of the tooth; nor have I hitherto mentioned it. If the upper surface be concave, the lower or exposed surface would be convex, unless it be contended that the tooth has greatly thickened edges, which is not actually the case. Is it possible that Mr. Atthey has mistaken the upper for the under surface? If so, I may well have failed to catch his meaning.

I have never been satisfied that the distinction between *C. cristatus* and *C. tuberculatus* was well founded; but I readily admit that I ought either to have stated this explicitly, or to have cited Messrs. Hancock and Atthey's statement in their own language. Criticism of proposed species, however, was no part of my plan.

If Mr. Atthey will assure us that he can substantiate by indisputable specimens the restoration, Nat. Hist. Trans. N. & D. vol. iv. t. xiv., I am prepared to accept his statement, notwithstanding its *primâ facie* improbability. Your obedient servant,

L. C. Miall.

Observations on the Period of the Extinction of the ancient Fauna of the Island of Rodriguez. By M. Alph. Milne-Edwards.

The imperfect knowledge we possess of the ancient fauna of the island of Rodriguez, and the unexpected facts discovered by the palæontological study of the bones collected from the caves there, give real importance to all the authentic information we can find in the accounts of the old travellers on the productions of that island. François Leguat, who staid at Rodriguez from 1691 to 1693, and published some very careful observations on all he had seen there, described its plants and animals. Most of his assertions have been corroborated by the palæontological discoveries recently made; and, in several memoirs which I have had the honour to present to the Academy, I have made known the zoological characters of some birds mentioned by Leguat, and of which the species have entirely disappeared. But at what period did this extinction take place? and to what cause was it due? To resolve these questions we had no certain guide. We are now acquainted with another document

of great value, completing up to a certain point the indications given by Leguat, and nearly forty years subsequent to his narrative.

It is a manuscript found in the Ministère de la Marine, entitled "Relation de l'île Rodrigue." It was discovered by M. Rouillard, a magistrate of Mauritius, who was making some special investigations in these archives. I was informed of this fact by Mr. Alfred Newton *, Professor at the University of Cambridge; and he requested me to search in the archives of the ministry in order to settle the time when this document was written; for it bears no date and no author's name, and is bound up together with other manuscripts in vol. xii. of the 'Correspondance de l'île de France,' année 1760. Is this date the correct one? and may we conclude that the birds in question were still living in 1760—that is to say, scarcely more than a hundred years ago?

I am convinced that this document is older than those with which it has been combined; and if I have not been able to discover its author, I have been able to fix its period. In fact I found in vol. i. of the 'Correspondance générale' an old inventory of reports and letters, from 1719 to 1732, contained in the portfolios of the office before they were collected and bound in volumes. In this enumeration is found our 'Relation de l'île Rodrigue' intercalated between some documents of the date 1729 and others of 1730 and 1731. Its inventory number corresponds exactly to that found on the 'Relation' itself; it is "No. 1, Carton 29." This indication therefore enables us to establish precisely, if not the time when the report was written, at least when it was transmitted to the Compagnie des Indes. It is, then, anterior to 1730, and it was by mistake that it was bound up with the Correspondence of 1760.

I should moreover remark that, according to the above-mentioned inventory, Carton No. 29 must have also contained a "deliberation of the Council" (of the Compagnie des Indes), "July 20, 1725, as to taking possession of the island of Diego Ruys"—that is, of Rodriguez. There is consequently reason to suppose that after the deliberation the Company commissioned one of its officers to go and study the resources of the island, and find out if it was advisable to make a settlement there. Our 'Relation,' transmitted four years after, seems to answer completely questions of this sort. The unknown author of the report first gives all the information necessary to facilitate the landing, indicating all the islets and reefs; he then reviews the animal and vegetable productions, and has not forgotten the survey of the soil and its arable qualities.

This account permits us to affirm that forty years after Leguat's departure the fauna of Rodriguez still included all the interesting ornithic types described by him, and that their extinction was subsequent to that date. It also gives us details of the habits, forms, and colours of several species of which I had recognized the existence and zoological affinities from their bones alone; and it confirms the results at which I had arrived.

* Prof. A. Newton presented to the Zoological Society of London, at its meeting on the 19th January, 1875, some extracts from the 'Relation.'

It takes up in succession the solitaire and the birds I made known under the names of *Erythromachus Leguati*, *Ardea megacephala*, *Athene murivora*, and *Necropsittacus rodericanus**. The 'Relation' shows distinctly that the ornithic fauna of the island did not undergo any notable modification during the first part of the 18th century, since the species mentioned by Leguat were still existing in 1730; while we know that in 1761, when the astronomer Pingré staid there, the solitaires had become so rare that Pingré speaks of them only from hearsay, having never observed them himself. It gives no indication about the other land-birds. We have therefore reason to think that extinction of these species, commenced probably at the time of Leguat's stay, proceeded with ever increasing rapidity, and must have reached its maximum between 1730 and 1760. The documents collected at the Ministère de la Marine leave but little doubt on the subject; and, thanks to them, we can not only, so to speak, be present at the destruction of one group of animals which was formerly extremely abundant at Rodriguez (I mean the land-tortoises), but also well account for their disappearance. The causes which brought about their extinction are, according to all probability, those which annihilated the birds.

In the reports addressed to the Compagnie des Indes, preserved in the archives of the Ministère de la Marine, we see that the island of Rodriguez was regarded as a sort of provisioning-store, not only for the Isle of France and the island of Bourbon, but also for the ships frequenting those parts. They came there regularly for tortoises. Already, in 1726 or 1727, M. Lenoir, during his visit to the Isle of France, wrote to the council of the Company:—

"Vessels going to and returning from India must not be suffered to go and carry off without discretion the land-tortoises from the neighbouring islets; and the captains must be forbidden to send their boats to take them without apprising the commandant of the island of the fact, and of the number they intend to take away"†.

Butcher's meat was often deficient at the Isle of France; and we find that a regular provisioning-service was gradually organized at Rodriguez. The various governors frequently sent ships, which returned loaded with tortoises, and had no other destination. In 1737 M. de la Bourdonnais ordered some expeditions of this kind; but he did not keep an exact account of them, and we cannot judge of their importance. On the other hand, M. Desforge-Boucher, in his reports addressed to the Company in 1759 and 1760, enumerates not only the ships he employed on this service, but also the number of tortoises collected and brought away by each of them. Four small vessels, 'la Mignonne,' 'l'Oiseau,' 'le Vollant,' and 'la Pénélope,' were at that time appropriated almost exclusively to this traffic; and an officer resided at Rodriguez to superintend them. I have not space to quote the extracts from the journal of Governor Desforge-Boucher where he speaks of these expeditions; it will suf-

* The portions of the 'Relation' which refer to natural history will be published in the 'Annales des Sciences Naturelles.'

† MS. documents collected under the title of "Code de l'île de France," 1556 to 1768 (Archives de la Marine).

fice to say that, according to the abstract which I have made of the account (probably incomplete) he kept of the arrivals, he caused to be removed from Rodriguez more than 30,000 land-tortoises in less than eighteen months. When we reflect on the small extent of the island, we cannot be surprised that these animals, formerly so common, have entirely disappeared; notwithstanding their fecundity, they could not withstand such means of destruction.

That which we have stated concerning the tortoises must have taken place also with the land-birds. It is evident that the sailors would not abstain from pursuing and killing them. Those species whose undeveloped wings rendered them easy to capture, while the delicacy of their flesh made them sought after, must have been rapidly exterminated. It is therefore unnecessary, in order to account for their extinction, to invoke changes in the biological conditions; the action of man was amply sufficient, and was exerted there without impediment and with more facility than anywhere else. It is still going on in many other parts of the globe; and we can already foresee the period when many wingless birds, large Cetacea, and certain species of seals and otaries will have been annihilated by man. —*Comptes Rendus de l'Académie des Sciences,* May 10, 1875.

On the Development of the Pteropoda. By M. H. Fol.

The vitellus of the Pteropoda before fecundation is histologically a simple cell with a deposit of nutritive matter in its interior. This fecundated vitellus is destitute of membrane and nucleus. It is composed of a formative or protoplasmic portion and of a nutritive portion composed of a network of protoplasm, in the meshes of which the nutritive globules occur. In the centre of the formative part there is a star formed by the granules of the protoplasm arranged in diverging straight lines. The rays of this star stretch to the limit of the formative portion; and the nutritive globules arrange themselves in lines.

After the egress of the so-called corpuscle of direction, a nucleus appears in the centre of the star, which is effaced in proportion to the growth of this nucleus. The granules and the globules of the vitellus cease to be in lines. Before each segmentation the nucleus disappears, to be replaced by two molecular stars which originate in its interior. The centre of each of these stars may be regarded as a centre of attraction; and all the vitelline substance obeys this attraction. After segmentation, a nucleus reappears in the middle of each star, and the vitelline substance remains at rest.

The result of segmentation, which differs little from the recognized types of the Gasteropods, is the development of a nutritive portion, composed of three large spheres, and of a formative moicty, of transparent spherules. Afterwards the nutritive cells divide, producing a superficial layer of little cells, which in the end envelop the three large nutritive spheres and constitute the ectoderm. The fourth of the large central spheres, entirely composed of protoplasm, divides completely and causes a thickening of the ectodermic layer. This region corresponds to the lower extremity of the larva. The line of junction of the three nutritive spherules coincides with the oral-